

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 14 July 2000 (14.07.00)	
International application No. PCT/CA99/01012	Applicant's or agent's file reference 13693-8pctJA
International filing date (day/month/year) 29 October 1999 (29.10.99)	Priority date (day/month/year) 30 October 1998 (30.10.98)
Applicant MOINEAU, Gilbert et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

29 May 2000 (29.05.00)

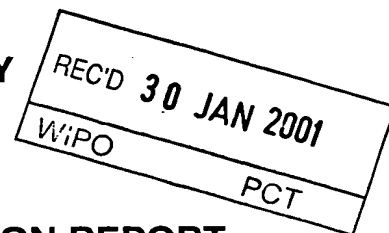
☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Nestor Santesso
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

15

Applicant's or agent's file reference 13693-8pctJA		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/CA99/01012	International filing date (day/month/year) 29/10/1999	Priority date (day/month/year) 30/10/1998	
International Patent Classification (IPC) or national classification and IPC H04L29/12			
Applicant EICON TECHNOLOGY CORPORATION et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 29/05/2000	Date of completion of this report 25. 01. 01
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Ferrari, J Telephone No. +49 89 2399 8803



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/CA99/01012

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

Description, pages:

1,6-10	as originally filed		
2-5	as received on	05/01/2001	with letter of 04/01/2001

Claims, No.:

1-22	as received on	05/01/2001	with letter of 04/01/2001
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Drawings, sheets:

1/1	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

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- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/CA99/01012

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-22
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-22
Industrial applicability (IA)	Yes:	Claims	1-22
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

General Comments:

While the applicant's observations submitted with the amended claims have been considered, the previously expressed opinion is nevertheless maintained as no substantial amendments have been filed which could meet the objections raised in the first Written Opinion of 05.10.2000. The minor amendments in independent claims 1 and 13 filed with letter of 04.01.2001 consist only of conventional components which are well known in the field of computer networks.

Ad section V.:

The cited documents are referred to in the order given in the International Search Report (D1-D3).

CLAIMS 1, 13

The common basic technical aspect as broadly defined by the apparatus and method category of claims 1 and 13 respectively, namely a network modem comprising a local store, a router and a Domain Name Service relay module for managing domain name requests on a LAN consists merely in the juxtaposition of both known features and common measures functioning in their normal way and not producing any non-obvious working interrelationship. The combined features do not mutually support each other in their effects to such an extent that a new and surprising technical result is achieved.

The features of present **claim 1** are those of the combination of a network modem device connecting a Local Area Network through a router to a remote network and of a Domain Name Service (DNS) relay module.

Network modems and routers are very well known devices in computer networks, so that no particular document must be cited to show this.

Having regard to the remaining technical features of claim 1, which mainly relate to the technical components and functions of a DNS, namely analysing requests for numeric addresses in response to a domain name using a local store contain-

ning a list of domain or host names and attribute data, and generating a DNS request via a router to an external DNS on the remote network and responding for the request in case of having the requested domain name not in the list, and replying to the request using attribute data when the requested domain name is on the list, all these features are very well known components and functional terms of a conventional Domain Name Server.

Such a conventional DNS is described in document D1 which discloses an article about "Reliability of WWW name servers" and especially of Domain Name Servers (see page 773, left-hand column, line 1 to right-hand column, line 11; page 775, right-hand column, line 11 to page 776, left-hand column, line 28; figure 1). The DNS described in chapter 3.1 of D1 contains a shared database which is a cache for the local DNS. Queries received from user agents are analysed and if the requested information (domain names) is not locally known in the shared database, the request is forwarded to a foreign Name Server, otherwise, the queries are solved from the information contained in the shared database.

The incorporation of a known DNS and a known router into a known network modem is not explicitly disclosed in document D1.

However, the subject-matter of claim 1 consists only in the juxtaposition of known components in the field of computer networks, namely incorporating a router and a DNS into a network modem. Such a combination can only be regarded as inventive, if the resulting device presents unexpected effects or properties in relation to those described in the art (D1). However, no such effects or properties can be seen in the subject-matter as claimed in claim 1.

A person skilled in the art could thus arrive without the exercise of inventive skill to the claimed subject-matter of claim 1, in accordance with circumstances, only by incorporating (combining) a conventional router and the known Domain Name Server from D1 into a conventional network modem in order to connect a LAN via said modem to a remote network.

Consequently, the subject-matter of present claim 1 is not judged to involve an inventive step, Article 33(3) PCT.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/CA99/01012

The same objection applies to independent **claim 13** which defines the same technical aspect as claim 1, but in terms of corresponding method steps. Accordingly, the subject-matter of independent claim 13 also lacks an inventive step, Article 33(3) PCT.

CLAIMS 2-12, 14-22

Dependent claims are only acceptable when appended to an acceptable independent claim. This not being the case, dependent claims 2 to 12 and 14 to 22 respectively, also do not meet the requirements of Article 33(3) PCT. However, most of the additional features defined in these dependent claims appear to be directly derivable from the disclosures D1 to D3 cited in the Search Report.

Ad section VII.:

The following deficiencies are also found in the application:

- a) The claims do not meet the requirements of Rule 6.2b PCT in that they do not contain reference signs.
- b) Independent claims 1 and 13 do not meet the requirements of Rule 6.3b PCT in that they are not divided in the correct two-part form.

Ad section VIII.:

CLAIMS 3, 6

Claims of the category "apparatus" should clearly be defined in terms of apparatus features in order to fulfill all the requirements of clarity of Article 6 PCT. This applies to claims 3 and 6 presently on file which relate to a network modem device whereas nearly all of the defined features are formulated as method steps or functional terms.

Claims 3 and 6 do therefore not meet the requirements of clarity, Article 6 PCT.

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Computer networks are being installed in more and more residential, office and industrial environments, and the increase in the number of such networks has increased the need for skilled technicians required to configure and maintain such networks. Any simplification of the task of network management is important from the perspective of both increased reliability and reduced training for the network manager. A Local Area Network (LAN) is a communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system and a communications link.

- 10 A problem arises when a station on a LAN is requesting an IP address using a domain or host name, especially on small networks when no local DNS is available. The DNS specified for the station will receive the request for the IP address and a connection to the Internet or to an external network will be made to reach the DNS server which will also try to find the domain or host name by verifying the existence of such a domain. In the case where the machine intended was on the LAN, the connection to the external network has caused unnecessary overhead in connection time and costs.

- 20 A second problem arises when a station often requests the same external IP address. The DNS must always be contacted through a connection to the external network to reply with the correct IP address. If these repeated connections are in a reduced period of time, it would most probably be unnecessary to request the IP address every time the domain name is to be contacted. This problem slows the connection causing unnecessary costs.

- 25 A conventional DNS is described in an article entitled "Reliability of WWW name servers" by Rowe K E et al., published in Computer Networks and ISDN systems in April 1995.

30 Summary of the Invention

It would be advantageous to have a DNS on a digital modem, which would readily recognize communication requests between users of the LAN and reply locally while acting as a "local" DNS.

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It would also be advantageous to have a DNS on a digital modem which would forward the requests for external network addresses to an external DNS and which would keep an up-to-date list of the replies received from the external
5 DNS in order to rapidly answer a request for the same IP address at a later time.

It is therefore an object of the invention to provide a DNS relay module that provides a rapid response to domain name requests from a local store of IP
10 addresses.

It is also an object of the present invention to provide a DNS relay module that replies to Internal Domain name requests by acting as a local DNS using a list of local hosts names automatically built by looking at NetBIOS over IP packets
15 sent by Windows stations.

It is furthermore an object of the present invention to provide a DNS relay module that forwards IP address requests to an external DNS.

It is equally an object to provide such a DNS relay module that manages the sending of requests to more than one external DNSs in a manner transparent to the LAN clients to provide better efficiency.
20

It is also an object of the present invention to provide a DNS relay module that fetches, from the local store of IP addresses, the ISDN channel on which the communication should be sent.
25

According to a first aspect of the present invention, a network modem device connecting a Local Area Network (LAN) to a remote network is provided. It comprises a local store containing a list of domain or host names and attribute
30 data; a Domain Name Service (DNS) relay module; and a router having a LAN interface connected to the LAN, a local connection to the DNS relay module and a network connection to the remote network; wherein the DNS relay module

- 4 -

- uses the list and the attribute data to respond to requests, received from the LAN via the router on the local connection, for a numeric address in response to a domain name when the domain name requested is on the list, and the DNS relay module generates a DNS request and transmits the DNS request to an external DNS on the remote network via the local connection to the router, and the DNS relay module returning a reply from the external DNS to the LAN via the local connection to the router to respond to the request for a numeric address when the domain name requested is not on the list.
- 5
- 10 According to a preferred embodiment of the present invention, the attribute data identifies a domain or host name as a local station on the LAN and the DNS relay module, when the domain or host name is identified as a local station on the LAN, replies locally to said request.
- 15 According to another preferred embodiment of the present invention, the DNS relay module listens to NetBIOS Over IP packets of information, extracts local computer names and IP addresses from the packets and adds these computer names and IP addresses to the list of domain names.
- 20 According to another preferred embodiment of the present invention, the list comprises domain names looked-up on the external DNS and the DNS relay module automatically adds to this list of domain names looked-up on the external DNS, an entry corresponding to the reply from the external DNS.
- 25 According to another preferred embodiment of the present invention, the list comprises both domain names looked-up on an external DNS with corresponding attribute data and host names declared on the LAN with corresponding attribute data.
- 30 According to still another aspect of the present invention, there is provided a method for relaying DNS requests on a LAN connected through a router to a remote network by a network modem device. The method comprises a Domain Name Service (DNS) relay module receiving a domain name request via the

5 DNS relay module and a network connection to the remote network, on the local connection, for a numeric address in response to a domain name; the DNS relay module using a local store containing a list of domain or host names and attribute data to respond to the request when the domain name requested is on the list, the DNS relay module generating a DNS request and transmitting the DNS request to an external DNS on the remote network via the local connection to the router, and the DNS relay module returning a reply from the external DNS to the LAN via the local connection to the router to respond to the request for a
10 numeric address when the domain name requested is not on the list.

Brief Description of the Drawings

15 The invention will be better understood by way of the following detailed description of a preferred embodiment with reference to the appended drawings, in which:
Fig. 1 is a schematic block diagram of the DNS Relay Module used in a digital modem.

Detailed Description of the Preferred Embodiment

20 As illustrated in Fig. 1, the digital modem 10 according to the preferred embodiment is an ISDN modem having a plurality of functional components shown in Fig. 1. The separation of components illustrated in the separate blocks in Fig. 1 is for the purposes of illustration only, and does not necessarily reflect the physical separation of components in the real device which is built from both
25 hardware and software/firmware components.

Modem 10 acts as a router or gateway to a remote network via, in the preferred embodiment, an ISDN connection 20. In the preferred embodiment, one

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CLAIMS

1. A network modem device connecting a Local Area Network (LAN) to a remote network, comprising:
a local store containing a list of domain or host names and attribute data;
a Domain Name Service (DNS) relay module; and
a router having a LAN interface connected to said LAN, a local connection to said DNS relay module and a network connection to said remote network;
wherein said DNS relay module uses said list and said attribute data to respond to requests, received from said LAN via said router on said local connection, for a numeric address in response to a domain name when said domain name requested is on said list, and said DNS relay module generates a DNS request and transmits said DNS request to an external DNS on said remote network via said local connection to said router, and said DNS relay module returning a reply from said external DNS to said LAN via said local connection to said router to respond to said request for a numeric address when said domain name requested is not on said list.
2. A network modem device as claimed in claim 1, wherein said attribute data is an IP address.
3. A network modem device as claimed in claim 1, wherein said attribute data identifies a domain or host name as a local station on said LAN and said DNS relay module, when said domain or host name is identified as a local station on said LAN, replies locally to said request.
4. A network modem device as claimed in claim 1, wherein said network connection is a connection to at least one ISDN channel.
5. A network modem device as claimed in claim 4, wherein said router is connected to two ISDN channels: one for the intranet and one for the Internet.

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6. A network modem device as claimed in claim 3, wherein said DNS relay module listens to NetBIOS Over IP packets of information on said LAN, extracts local computer names and associated IP addresses from said packets and adds said computer names and associated IP addresses to said list of domain names.

7. A network modem device as claimed in claim 2, wherein said list is a list of domain names looked-up on the external DNS, and said DNS relay module automatically adds to said list of domain names looked-up on the external DNS, an entry corresponding to said reply from said external DNS.

8. The device according to claim 1, wherein said device is a digital network modem.

9. The device according to claim 8, wherein said device is an ISDN modem.

10. The device according to claim 1, wherein said list comprises :
a list of domain names looked-up on an external DNS with corresponding attribute data; and
a list of host names declared on said LAN with corresponding attribute data.

11. The device according to claim 1, wherein said external DNS is one of a group of external DNSs.

12. The device as claimed in claim 1, wherein said list of domain names and attribute data has an expiry date and time, and said DNS relay module comprises a mechanism for requesting from an external DNS a newly fetched numeric address for said domain name when a next request for said domain name will be received, for restoring said newly fetched numeric address as the attribute data for said domain name in said list and for refreshing said expiry date and time.

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- 13 -

13. A method for relaying DNS requests on a LAN connected through a router to a remote network by a network modem device, comprising:

a Domain Name Service (DNS) relay module receiving a domain name request via said router having a LAN interface connected to said LAN, a local connection to said DNS relay module and a network connection to said remote network, on said local connection, for a numeric address in response to a domain name;

said DNS relay module using a local store containing a list of domain or host names and attribute data to respond to said request when said domain name requested is on said list,

said DNS relay module generating a DNS request and transmitting said DNS request to an external DNS on said remote network via said local connection to said router, and said DNS relay module returning a reply from said external DNS to said LAN via said local connection to said router to respond to said request for a numeric address when said domain name requested is not on said list.

14. A method as claimed in claim 13, wherein said attribute data identifies a domain name as a domain name for a device on said LAN.

15. A method as claimed in claim 13, wherein said generating comprises requesting a numeric address on said external DNS and responding to said request with a numeric address corresponding to said domain or host name.

16. A method as claimed in claim 13, wherein said attribute data is an IP address.

17. A method as claimed in claim 14, further comprising steps of listening to NetBIOS Over IP packets of information, extracting local computer names and IP addresses from said packets and adding said computer names and IP addresses to said list of domain names.

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- 14 -

18. A method as claimed in claim 17, wherein said list of computer names declared on the LAN is automatically built using packets of information sent by stations on said LAN using NetBIOS Over IP protocol in which said station name and IP address is available.

19. A method as claimed in claim 13, further comprising a step of automatically adding to said list of domain names looked-up on the external DNS, an entry corresponding to said reply from said external DNS and wherein said list is a list of domain names looked-up on the external DNS.

20. A method as claimed in claim 13, wherein said list comprises :
a list of domain names looked-up on an external DNS with corresponding attribute data; and
a list of host names declared on said LAN with corresponding attribute data.

21. A method as claimed in claim 13, wherein said external DNS is one of a group of external DNSs.

22. A method as claimed in claim 13, wherein said list of domain names and attribute data has an expiry date and time and said method further comprises the steps of
requesting from an external DNS, a newly fetched numeric address for said domain name when a next request for said domain name will be received,
restoring said newly fetched numeric address as the attribute data for said domain name in said list and
refreshing said expiry date and time.

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

SWABEY OGILVY RENAULT
McGILL COLLEGE

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FEB 5 2001

PCT

- 15 pages

To:

SWABEY OGILVY RENAULT
1981, Avenue McGill College
Bureau 1600
Montréal, Québec H3A 2Y3
CANADA

A.M.

7/8/9

10/11/12

1/2/3/4/5/6

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Confirmation
FAX-Bestätigung

Date of mailing
(day/month/year)

25.01.01

Applicant's or agent's file reference
13693-8pctJA

IMPORTANT NOTIFICATION

International application No.
PCT/CA99/01012

International filing date (day/month/year)
29/10/1999

Priority date (day/month/year)
30/10/1998

Applicant

EICON TECHNOLOGY CORPORATION et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Ahrens, R

Tel. +49 89 2399-8136



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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Ferrari, J Telephone No. +49 89 2399 8803 

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The cited documents are referred to in the order given in the International Search Report (D1-D3).

CLAIMS 1, 13

The common basic technical aspect as broadly defined by the apparatus and method category of claims 1 and 13 respectively, namely a network modem comprising a local store, a router and a Domain Name Service relay module for managing domain name requests on a LAN consists merely in the juxtaposition of both known features and common measures functioning in their normal way and not producing any non-obvious working interrelationship. The combined features do not mutually support each other in their effects to such an extent that a new and surprising technical result is achieved.

The features of present **claim 1** are those of the combination of a network modem device connecting a Local Area Network through a router to a remote network and of a Domain Name Service (DNS) relay module.

Network modems and routers are very well known devices in computer networks, so that no particular document must be cited to show this.

Having regard to the remaining technical features of claim 1, which mainly relate to the technical components and functions of a DNS, namely analysing requests for numeric addresses in response to a domain name using a local store contain-

ning a list of domain or host names and attribute data, and generating a DNS request via a router to an external DNS on the remote network and responding for the request in case of having the requested domain name not in the list, and replying to the request using attribute data when the requested domain name is on the list, all these features are very well known components and functional terms of a conventional Domain Name Server.

Such a conventional DNS is described in document D1 which discloses an article about "Reliability of WWW name servers" and especially of Domain Name Servers (see page 773, left-hand column, line 1 to right-hand column, line 11; page 775, right-hand column, line 11 to page 776, left-hand column, line 28; figure 1). The DNS described in chapter 3.1 of D1 contains a shared database which is a cache for the local DNS. Queries received from user agents are analysed and if the requested information (domain names) is not locally known in the shared database, the request is forwarded to a foreign Name Server, otherwise, the queries are solved from the information contained in the shared database.

The incorporation of a known DNS and a known router into a known network modem is not explicitly disclosed in document D1.

However, the subject-matter of claim 1 consists only in the juxtaposition of known components in the field of computer networks, namely incorporating a router and a DNS into a network modem. Such a combination can only be regarded as inventive, if the resulting device presents unexpected effects or properties in relation to those described in the art (D1). However, no such effects or properties can be seen in the subject-matter as claimed in claim 1.

A person skilled in the art could thus arrive without the exercise of inventive skill to the claimed subject-matter of claim 1, in accordance with circumstances, only by incorporating (combining) a conventional router and the known Domain Name Server from D1 into a conventional network modem in order to connect a LAN via said modem to a remote network.

Consequently, the subject-matter of present claim 1 is not judged to involve an inventive step, Article 33(3) PCT.

The same objection applies to independent **claim 13** which defines the same technical aspect as claim 1, but in terms of corresponding method steps. Accordingly, the subject-matter of independent claim 13 also lacks an inventive step, Article 33(3) PCT.

CLAIMS 2-12, 14-22

Dependent claims are only acceptable when appended to an acceptable independent claim. This not being the case, dependent claims 2 to 12 and 14 to 22 respectively, also do not meet the requirements of Article 33(3) PCT. However, most of the additional features defined in these dependent claims appear to be directly derivable from the disclosures D1 to D3 cited in the Search Report.

Ad section VII.:

The following deficiencies are also found in the application:

- a) The claims do not meet the requirements of Rule 6.2b PCT in that they do not contain reference signs.
- b) Independent claims 1 and 13 do not meet the requirements of Rule 6.3b PCT in that they are not divided in the correct two-part form.

Ad section VIII.:

CLAIMS 3, 6

Claims of the category "apparatus" should clearly be defined in terms of apparatus features in order to fulfill all the requirements of clarity of Article 6 PCT. This applies to claims 3 and 6 presently on file which relate to a network modem device whereas nearly all of the defined features are formulated as method steps or functional terms.

Claims 3 and 6 do therefore not meet the requirements of clarity, Article 6 PCT.

Computer networks are being installed in more and more residential, office and industrial environments, and the increase in the number of such networks has increased the need for skilled technicians required to configure and maintain such networks. Any simplification of the task of network management is important from the perspective of both increased reliability and reduced training for the network manager. A Local Area Network (LAN) is a communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system and a communications link.

10 A problem arises when a station on a LAN is requesting an IP address using a domain or host name, especially on small networks when no local DNS is available. The DNS specified for the station will receive the request for the IP address and a connection to the Internet or to an external network will be made to reach the DNS server which will also try to find the domain or host name by
15 verifying the existence of such a domain. In the case where the machine intended was on the LAN, the connection to the external network has caused unnecessary overhead in connection time and costs.

A second problem arises when a station often requests the same external IP address. The DNS must always be contacted through a connection to the
20 external network to reply with the correct IP address. If these repeated connections are in a reduced period of time, it would most probably be unnecessary to request the IP address every time the domain name is to be contacted. This problem slows the connection causing unnecessary costs.

25 A conventional DNS is described in an article entitled "Reliability of WWW name servers" by Rowe K E et al., published in Computer Networks and ISDN systems in April 1996.

30 Summary of the Invention

It would be advantageous to have a DNS on a digital modem, which would readily recognize communication requests between users of the LAN and reply locally while acting as a "local" DNS.

It would also be advantageous to have a DNS on a digital modem which would forward the requests for external network addresses to an external DNS and which would keep an up-to-date list of the replies received from the external
5 DNS in order to rapidly answer a request for the same IP address at a later time.

It is therefore an object of the invention to provide a DNS relay module that provides a rapid response to domain name requests from a local store of IP
10 addresses.

It is also an object of the present invention to provide a DNS relay module that replies to Internal Domain name requests by acting as a local DNS using a list of local hosts names automatically built by looking at NetBIOS over IP packets
15 sent by Windows stations.

It is furthermore an object of the present invention to provide a DNS relay module that forwards IP address requests to an external DNS.

20 It is equally an object to provide such a DNS relay module that manages the sending of requests to more than one external DNSs in a manner transparent to the LAN clients to provide better efficiency.

It is also an object of the present invention to provide a DNS relay module that
25 fetches, from the local store of IP addresses, the ISDN channel on which the communication should be sent.

According to a first aspect of the present invention, a network modem device connecting a Local Area Network (LAN) to a remote network is provided. It
30 comprises a local store containing a list of domain or host names and attribute data; a Domain Name Service (DNS) relay module; and a router having a LAN interface connected to the LAN, a local connection to the DNS relay module and a network connection to the remote network; wherein the DNS relay module

- uses the list and the attribute data to respond to requests, received from the LAN via the router on the local connection, for a numeric address in response to a domain name when the domain name requested is on the list, and the DNS relay module generates a DNS request and transmits the DNS request to an external DNS on the remote network via the local connection to the router, and the DNS relay module returning a reply from the external DNS to the LAN via the local connection to the router to respond to the request for a numeric address when the domain name requested is not on the list.
- 5
- 10 According to a preferred embodiment of the present invention, the attribute data identifies a domain or host name as a local station on the LAN and the DNS relay module, when the domain or host name is identified as a local station on the LAN, replies locally to said request.
- 15 According to another preferred embodiment of the present invention, the DNS relay module listens to NetBIOS Over IP packets of information, extracts local computer names and IP addresses from the packets and adds these computer names and IP addresses to the list of domain names.
- 20 According to another preferred embodiment of the present invention, the list comprises domain names looked-up on the external DNS and the DNS relay module automatically adds to this list of domain names looked-up on the external DNS, an entry corresponding to the reply from the external DNS.
- 25 According to another preferred embodiment of the present invention, the list comprises both domain names looked-up on an external DNS with corresponding attribute data and host names declared on the LAN with corresponding attribute data.
- 30 According to still another aspect of the present invention, there is provided a method for relaying DNS requests on a LAN connected through a router to a remote network by a network modem device. The method comprises a Domain Name Service (DNS) relay module receiving a domain name request via the

DNS relay module and a network connection to the remote network, on the local connection, for a numeric address in response to a domain name; the DNS relay module using a local store containing a list of domain or host names and attribute data to respond to the request when the domain name requested is on the list, the DNS relay module generating a DNS request and transmitting the DNS request to an external DNS on the remote network via the local connection to the router, and the DNS relay module returning a reply from the external DNS to the LAN via the local connection to the router to respond to the request for a numeric address when the domain name requested is not on the list.

Brief Description of the Drawings

The invention will be better understood by way of the following detailed description of a preferred embodiment with reference to the appended drawings, in which:

Fig. 1 is a schematic block diagram of the DNS Relay Module used in a digital modem.

Detailed Description of the Preferred Embodiment

As illustrated in Fig. 1, the digital modem 10 according to the preferred embodiment is an ISDN modem having a plurality of functional components shown in Fig. 1. The separation of components illustrated in the separate blocks in Fig. 1 is for the purposes of illustration only, and does not necessarily reflect the physical separation of components in the real device which is built from both hardware and software/firmware components.

Modem 10 acts as a router or gateway to a remote network via, in the preferred embodiment, an ISDN connection 20. In the preferred embodiment, one

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CLAIMS

1. A network modem device connecting a Local Area Network (LAN) to a remote network, comprising:
a local store containing a list of domain or host names and attribute data;
a Domain Name Service (DNS) relay module; and
a router having a LAN interface connected to said LAN, a local connection to said DNS relay module and a network connection to said remote network;
wherein said DNS relay module uses said list and said attribute data to respond to requests, received from said LAN via said router on said local connection, for a numeric address in response to a domain name when said domain name requested is on said list, and said DNS relay module generates a DNS request and transmits said DNS request to an external DNS on said remote network via said local connection to said router, and said DNS relay module returning a reply from said external DNS to said LAN via said local connection to said router to respond to said request for a numeric address when said domain name requested is not on said list.
2. A network modem device as claimed in claim 1, wherein said attribute data is an IP address.
3. A network modem device as claimed in claim 1, wherein said attribute data identifies a domain or host name as a local station on said LAN and said DNS relay module, when said domain or host name is identified as a local station on said LAN, replies locally to said request.
4. A network modem device as claimed in claim 1, wherein said network connection is a connection to at least one ISDN channel.
5. A network modem device as claimed in claim 4, wherein said router is connected to two ISDN channels: one for the intranet and one for the Internet.

6. A network modem device as claimed in claim 3, wherein said DNS relay module listens to NetBIOS Over IP packets of information on said LAN, extracts local computer names and associated IP addresses from said packets and adds said computer names and associated IP addresses to said list of domain names.
7. A network modem device as claimed in claim 2, wherein said list is a list of domain names looked-up on the external DNS, and said DNS relay module automatically adds to said list of domain names looked-up on the external DNS, an entry corresponding to said reply from said external DNS.
8. The device according to claim 1, wherein said device is a digital network modem.
9. The device according to claim 8, wherein said device is an ISDN modem.
10. The device according to claim 1, wherein said list comprises :
a list of domain names looked-up on an external DNS with corresponding attribute data; and
a list of host names declared on said LAN with corresponding attribute data.
11. The device according to claim 1, wherein said external DNS is one of a group of external DNSs.
12. The device as claimed in claim 1, wherein said list of domain names and attribute data has an expiry date and time, and said DNS relay module comprises a mechanism for requesting from an external DNS a newly fetched numeric address for said domain name when a next request for said domain name will be received, for restoring said newly fetched numeric address as the attribute data for said domain name in said list and for refreshing said expiry date and time.

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13. A method for relaying DNS requests on a LAN connected through a router to a remote network by a network modem device, comprising:

a Domain Name Service (DNS) relay module receiving a domain name request via said router having a LAN interface connected to said LAN, a local connection to said DNS relay module and a network connection to said remote network, on said local connection, for a numeric address in response to a domain name;

said DNS relay module using a local store containing a list of domain or host names and attribute data to respond to said request when said domain name requested is on said list,

said DNS relay module generating a DNS request and transmitting said DNS request to an external DNS on said remote network via said local connection to said router, and said DNS relay module returning a reply from said external DNS to said LAN via said local connection to said router to respond to said request for a numeric address when said domain name requested is not on said list.

14. A method as claimed in claim 13, wherein said attribute data identifies a domain name as a domain name for a device on said LAN.

15. A method as claimed in claim 13, wherein said generating comprises requesting a numeric address on said external DNS and responding to said request with a numeric address corresponding to said domain or host name.

16. A method as claimed in claim 13, wherein said attribute data is an IP address.

17. A method as claimed in claim 14, further comprising steps of listening to NetBIOS Over IP packets of information, extracting local computer names and IP addresses from said packets and adding said computer names and IP addresses to said list of domain names.

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18. A method as claimed in claim 17, wherein said list of computer names declared on the LAN is automatically built using packets of information sent by stations on said LAN using NetBIOS Over IP protocol in which said station name and IP address is available.

19. A method as claimed in claim 13, further comprising a step of automatically adding to said list of domain names looked-up on the external DNS, an entry corresponding to said reply from said external DNS and wherein said list is a list of domain names looked-up on the external DNS.

20. A method as claimed in claim 13, wherein said list comprises :
a list of domain names looked-up on an external DNS with corresponding attribute data; and
a list of host names declared on said LAN with corresponding attribute data.

21. A method as claimed in claim 13, wherein said external DNS is one of a group of external DNSs.

22. A method as claimed in claim 13, wherein said list of domain names and attribute data has an expiry date and time and said method further comprises the steps of
requesting from an external DNS, a newly fetched numeric address for said domain name when a next request for said domain name will be received,
restoring said newly fetched numeric address as the attribute data for said domain name in said list and
refreshing said expiry date and time.

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DNS RELAY MODULE IN A DIGITAL NETWORK MODEM

Field of the Invention

The present invention relates to a digital network modem, such as an ISDN or a DSL modem, and more particularly, pertains to a digital network modem with a domain name server relay module.

Background of the Invention

To facilitate accessing and locating computers on a TCP/IP network, a Domain Name Service (DNS) is used. This name resolution software enables users to refer to computers by domain name or host names. The DNS server maintains a database of domain names (host names) and their corresponding IP addresses. In an Internet Protocol (IP) network, the application queries a DNS to turn the name of the machine it wishes to communicate with into its IP address. NETwork Basic Input Output System (NetBIOS) is an application programming interface that augments the DOS BIOS by adding special functions for LANs. It is the native networking protocol in DOS and Windows networks. NetBIOS computers are identified by a unique 15-character long name, and Windows machines (NetBIOS machines) periodically broadcast their names on the network so that Network Neighborhood can catalog them.

WINS (Windows Internet Naming Service) runs on Windows NT Server-based networks. It is a service that keeps a database of computer name-to-IP address mappings so that the NetBIOS computer names used in Windows network environments can be mapped to IP addresses when the underlying network is IP-based. When a user needs to access some computer, the NetBIOS name is referenced, and this name is handed to the nearest WINS server, which then returns an IP address. WINS is almost completely automatic from an administrative point of view. It builds its own database over time and automatically updates itself.

Computer networks are being installed in more and more residential, office and industrial environments, and the increase in the number of such networks has increased the need for skilled technicians required to configure and maintain such networks. Any simplification of the task of network management is important from the perspective of both increased reliability and reduced training for the network manager. A Local Area Network (LAN) is a communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system and a communications link.

A problem arises when a station on a LAN is requesting an IP address using a domain or host name, especially on small networks when no local DNS is available. The DNS specified for the station will receive the request for the IP address and a connection to the Internet or to an external network will be made to reach the DNS server which will also try to find the domain or host name by verifying the existence of such a domain. In the case where the machine intended was on the LAN, the connection to the external network has caused unnecessary overhead in connection time and costs.

A second problem arises when a station often requests the same external IP address. The DNS must always be contacted through a connection to the external network to reply with the correct IP address. If these repeated connections are in a reduced period of time, it would most probably be unnecessary to request the IP address every time the domain name is to be contacted. This problem slows the connection causing unnecessary costs.

Summary of the Invention

It would be advantageous to have a DNS on a digital modem, which would readily recognize communication requests between users of the LAN and reply locally while acting as a "local" DNS.

- 5 It would also be advantageous to have a DNS on a digital modem which would forward the requests for external network addresses to an external DNS and which would keep an up-to-date list of the replies received from the external DNS in order to rapidly answer a request for the same IP address at a later time.

10

It is therefore an object of the invention to provide a DNS relay module that provides a rapid response to domain name requests from a local store of IP addresses.

- 15 It is also an object of the present invention to provide a DNS relay module that replies to internal Domain name requests by acting as a local DNS using a list of local hosts names automatically built by looking at NetBIOS over IP packets sent by Windows stations.

- 20 It is furthermore an object of the present invention to provide a DNS relay module that forwards IP address requests to an external DNS.

- It is equally an object to provide such a DNS relay module that manages the sending of requests to more than one external DNSs in a manner transparent to
25 the LAN clients to provide better efficiency.

It is also an object of the present invention to provide a DNS relay module that fetches, from the local store of IP addresses, the ISDN channel on which the communication should be sent.

According to the invention, there is provided a network modem device connecting a Local Area Network (LAN) to a remote network, comprising a local store containing a list of domain or host names and attribute data and a
5 Domain Name Service (DNS) relay module. This DNS relay module uses the list and the attribute data to respond to requests for a numeric address in response to a domain name, when the domain name requested is on the list and generates a DNS request to an external DNS on the remote network and returns
10 a reply from the external DNS to respond to the request for a numeric address when the domain name requested is not on the list. The attribute data can be a numeric address (such as an IP address).

According to a preferred embodiment of the present invention, the attribute data identifies a domain or host name as a local station on the LAN and the
15 DNS relay module, when the domain or host name is identified as a local station on the LAN, replies locally to said request.

According to another preferred embodiment of the present invention, the DNS delay module listens to NetBIOS Over IP packets of information, extracts local
20 computer names and IP addresses from the packets and adds these computer names and IP addresses to the list of domain names.

According to another preferred embodiment of the present invention, the list comprises domain names looked-up on the external DNS and the DNS relay
25 module automatically adds to this list of domain names looked-up on the external DNS, an entry corresponding to the reply from the external DNS.

According to another preferred embodiment of the present invention, the list comprises both domain names looked-up on an external DNS with

corresponding attribute data and host names declared on the LAN with corresponding attribute data.

5 The invention also provides a method for relaying DNS requests on a LAN comprising 1. analyzing requests for a numeric address in response to a domain name using a local store containing a list of domain or host names and attribute data, 2. generating a DNS request to an external DNS on the remote network and returning a reply from the external DNS to respond to the request for a numeric address when the domain name requested is not on the list and 3.
10 replying to the request using the attribute data when the domain name requested is on the list.

Brief Description of the Drawings

15 The invention will be better understood by way of the following detailed description of a preferred embodiment with reference to the appended drawings, in which:

Fig. 1 is a schematic block diagram of the DNS Relay Module used in a digital modem.

20 Detailed Description of the Preferred Embodiment

As illustrated in Fig. 1, the digital modem 10 according to the preferred embodiment is an ISDN modem having a plurality of functional components shown in Fig. 1. The separation of components illustrated in the separate blocks in Fig. 1 is for the purposes of illustration only, and does not necessarily reflect
25 the physical separation of components in the real device which is built from both hardware and software/firmware components.

Modem 10 acts as a router or gateway to a remote network via, in the preferred embodiment, an ISDN connection 20. In the preferred embodiment, one

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channel of the ISDN line is connected to an Internet Service Provider (ISP) for Internet access, while the other channel is connected to a "private" intranet. When the modem 10 is connected to the Ethernet local area network (LAN) 22 and powered up, a LAN interface 12 and a System Tray / Modem Monitor 26
5 become active. The modem 10 includes a router 18 which communicates over connection 20 and with LAN interface 12. In operation, the modem 10 directs data traffic via router 18 onto the selected ISDN channel 20. Devices on LAN 22 send packets of information to one of the ISDN channels by sending a packet addressed to the modem 10 with the desired destination IP address and
10 message content contained in the packet. The router 18 forwards the message on one of the ISDN channels to the desired IP address.

In the reverse direction, router 18 receives packets from lines 20 and determines the desired destination on LAN 22, and forwards the packets via
15 interface 12 on LAN 22 with the correct desired destination address. In the preferred embodiment in which one channel is used for the intranet and the other for the Internet, router 18 also switches packets received from the LAN 22 based on the desired address either to the Internet channel or the intranet channel. Of course, both channels could be used for intranet or Internet
20 purposes, or even for connecting to a different type of data network.

Modem 10 includes, in the preferred embodiment, a DNS relay module 19. From the devices' point of view on the LAN 22, DNS Relay Module 19 becomes the primary DNS that they can refer to. Thus, in accordance with
25 TCP/IP, when an address is requested by domain name or host name, instead of using an IP address, the device sends a request to the DNS for the IP address for the domain or host name.

The DNS relay module 19 is however not a full DNS. The advantage of identifying module 19 as a DNS for the devices on the LAN 22 is that module 19 can contain lists of frequently-used domain names and can give specific responses immediately for those domain names, while other domain name requests can be passed on to a remote DNS, such as an ISP DNS. Furthermore, the domain name for an internal corporate domain name may be contained in module 19 or in a readily accessible list. For the requests to an internal corporate domain name, the IP address is returned directly instead of using the ISP DNS constantly. Fewer requests to the ISP DNS means faster service. Also, some intranet addresses may not be known to the outside world (private addresses) and the ISP DNS, for example. The DNS relay module 19 is also used to route the DNS requests to the Intranet DNS or the ISP DNS.

In the preferred embodiment of the present invention, the DNS Relay Module 19 compares the request from a station (24,30,32) on LAN 22 with at least one list. The list 15 can be configured and built by the Network Administrator using the Configuration station 24. Examples of useful lists are the following: a list of frequently-accessed domains, a list 15 of Domain names recently looked up on an external DNS, another list 16 of computer names declared on the LAN automatically built by looking at NetBIOS Over IP packets. These lists comprise the name of the domain or computer requested and the corresponding IP address. These lists would be consulted by the DNS Relay Module in an order appropriate for fastest results. In a preferred embodiment, the DNS Relay Module 19 consults two of these lists: the list 15 of domain names looked-up on an external DNS and the list 16 of computer names declared on its LAN. And, also in a preferred embodiment, the DNS consults the list 16 of computer names first, before consulting the list 15 of domain names.

These lists can be built up in many ways. A first manner is to make a new entry in the lists each time an IP address unknown from the lists is returned by the external DNS. In the case that the domain name or host name requested by a device on the LAN 22 is unknown to the DNS Relay Module 19 (i.e. it does not appear on any of its lists), the DNS Relay Module 19 forwards the request to an external DNS such as an ISP DNS. The DNS Relay Module 19 records the answer sent from the ISP DNS back to the device on the LAN 22 and adds this entry to one of its lists. These new entries can have an "expiry date". The life of an IP address can be set, for example, for one day. After a day, the DNS Relay Device 19 would forward the request to an external DNS as if the entry did not exist in the list and would record the reply. Since the local store on which these addresses are stored can be a stack, a First In, First Out queue could provide best results. Also, it should be possible at any time to reset these lists. When the table or list is full, the older entry is overwritten by the new one. The possibility of an overflow of addresses can also be eliminated by limiting the list to a certain amount of entries.

A second manner to make a new entry is to manually edit the lists. Only authorized users such as network administrators should be able to look at and edit the lists using the System Tray / Modem Monitor interface 26. These lists could be maintained manually for known changes in domain names or computer names.

DNS relay module 19 can also make use of the NETBIOS Over IP protocol supported in Microsoft Operating systems (Windows 95, 98 and NT). Using this protocol, the stations (24,30,32) on the LAN 22 advertise their computer (host) names and IP addresses. By intercepting these packets, the DNS relay module 19 can learn the DNS name of the PCs on the local LAN 22 and can store this information in a list (16). When a request for an IP address

corresponding to an entry in that list is made, the DNS relay module replies to the request while acting as a local DNS.

5 In the preferred embodiment where one channel is for the Internet and the other channel is for the intranet, the DNS relay module 19 only routes DNS requests , based on the domain name included inside the request. For example, xxx.mycompany.com would be identified as an intranet address and xxx.ibm.com would be referred as an Internet address. Any other packets are routed by (18).

10

Of course, once the DNS Relay Module 19 has returned an IP address for the domain or computer name to the station, the communications request will be routed by router 18 to the appropriate channel of ISDN connection 20, either intranet or internet.

15

The DNS relay module 19 can also contain two or more external DNS addresses. When a request for a domain name that was sent to the external DNS fails for a certain amount of failures (preferably only after two failures), the module 19 switches to using another one of the plurality of external DNS addresses. In this way, greater reliability and efficiency for accessing domain names from the LAN 22 is afforded. The stations (24,30,32) on the LAN 22 only need to know one DNS address, that of the DNS Relay Module 19 while in fact they have the benefit of multiple DNS working for them.

25 While the invention has been described in connection with specific embodiments thereof, it will be understood that it is capable of further modifications and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come

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within known or customary practice within the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as follows in the scope of the appended claims.

CLAIMS

1. A network modem device connecting a Local Area Network (LAN) to a remote network, comprising:
a local store containing a list of domain or host names and attribute data; and
a Domain Name Service (DNS) relay module
using said list and said attribute data to respond to requests for a numeric address in response to a domain name, when said domain name requested is on said list and
generating a DNS request to an external DNS on said remote network and
returning a reply from said external DNS to respond to said request for a numeric address when said domain name requested is not on said list.
2. A network modem device as claimed in claim 1, wherein said attribute data is an IP address.
3. A network modem device as claimed in claim 1, wherein said attribute data identifies a domain or host name as a local station on said LAN and said DNS relay module, when said domain or host name is identified as a local station on said LAN, replies locally to said request.
4. A network modem device as claimed in claim 1, wherein said Domain Name Server relay module is connected to a router and wherein said router is connected to at least one ISDN channel.
5. A network modem device as claimed in claim 4, wherein said router is connected to two ISDN channels: one for the intranet and one for the Internet.

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6. A network modem device as claimed in claim 3, wherein said DNS delay module listens to NetBIOS Over IP packets of information, extracts local computer names and associated IP addresses from said packets, adds said computer names and associated IP addresses to said list of domain names.

7. A network modem device as claimed in claim 2, wherein said list is a list of domain names looked-up on the external DNS, and said DNS relay module automatically adds to said list of domain names looked-up on the external DNS, an entry corresponding to said reply from said external DNS.

8. The device according to claim 1, wherein said device is a digital network modem.

9. The device according to claim 8, wherein said device is an ISDN modem.

10. The device according to claim 1, wherein said list comprises :
a list of domain names looked-up on an external DNS with corresponding attribute data; and
a list of host names declared on said LAN with corresponding attribute data.

11. The device according to claim 1, wherein said external DNS is one of a group of external DNSs.

12. The device as claimed in claim 1, wherein said list of domain names and attribute data has an expiry date and time, and said DNS relay module comprises a mechanism for requesting from an external DNS a newly fetched numeric address for said domain name when a next request for said domain name will be received, for restoring said newly fetched numeric address as the

attribute data for said domain name in said list and for refreshing said expiry date and time.

13. A method for relaying DNS requests on a LAN comprising:
analyzing requests for a numeric address in response to a domain name using a local store containing a list of domain or host names and attribute data;
generating a DNS request to an external DNS on said remote network and
returning a reply from said external DNS to respond to said request for a numeric address when said domain name requested is not on said list;
replying to said request using said attribute data when said domain name requested is on said list.
14. A method as claimed in claim 13, wherein said attribute data identifies a domain name as a domain name for a device on said LAN.
15. A method as claimed in claim 13, wherein said replying involves not requesting a numeric address on said external DNS and responding to said request with a numeric address corresponding to said domain or host name.
16. A method as claimed in claim 13, wherein said attribute data is an IP address.
17. A method as claimed in claim 14, further comprising steps of listening to NetBIOS Over IP packets of information, extracting local computer names and IP addresses from said packets and adding said computer names and IP addresses to said list of domain names.
18. A method as claimed in claim 17, wherein said list of computer names declared on the LAN is automatically built using packets of information sent by

stations on said LAN using NetBIOS Over IP protocol in which said station name and IP address is available.

19. A method as claimed in claim 13, further comprising a step of automatically adding to said list of domain names looked-up on the external DNS, an entry corresponding to said reply from said external DNS and wherein said list is a list of domain names looked-up on the external DNS.

20. A method as claimed in claim 13, wherein said list comprises :
a list of domain names looked-up on an external DNS with corresponding attribute data; and
a list of host names declared on said LAN with corresponding attribute data.

21. A method as claimed in claim 13, wherein said external DNS is one of a group of external DNSs.

22. A method as claimed in claim 13, wherein said list of domain names and attribute data has an expiry date and time and said method further comprises the steps of
requesting from an external DNS, a newly fetched numeric address for said domain name when a next request for said domain name will be received,
restoring said newly fetched numeric address as the attribute data for said domain name in said list and
refreshing said expiry date and time.

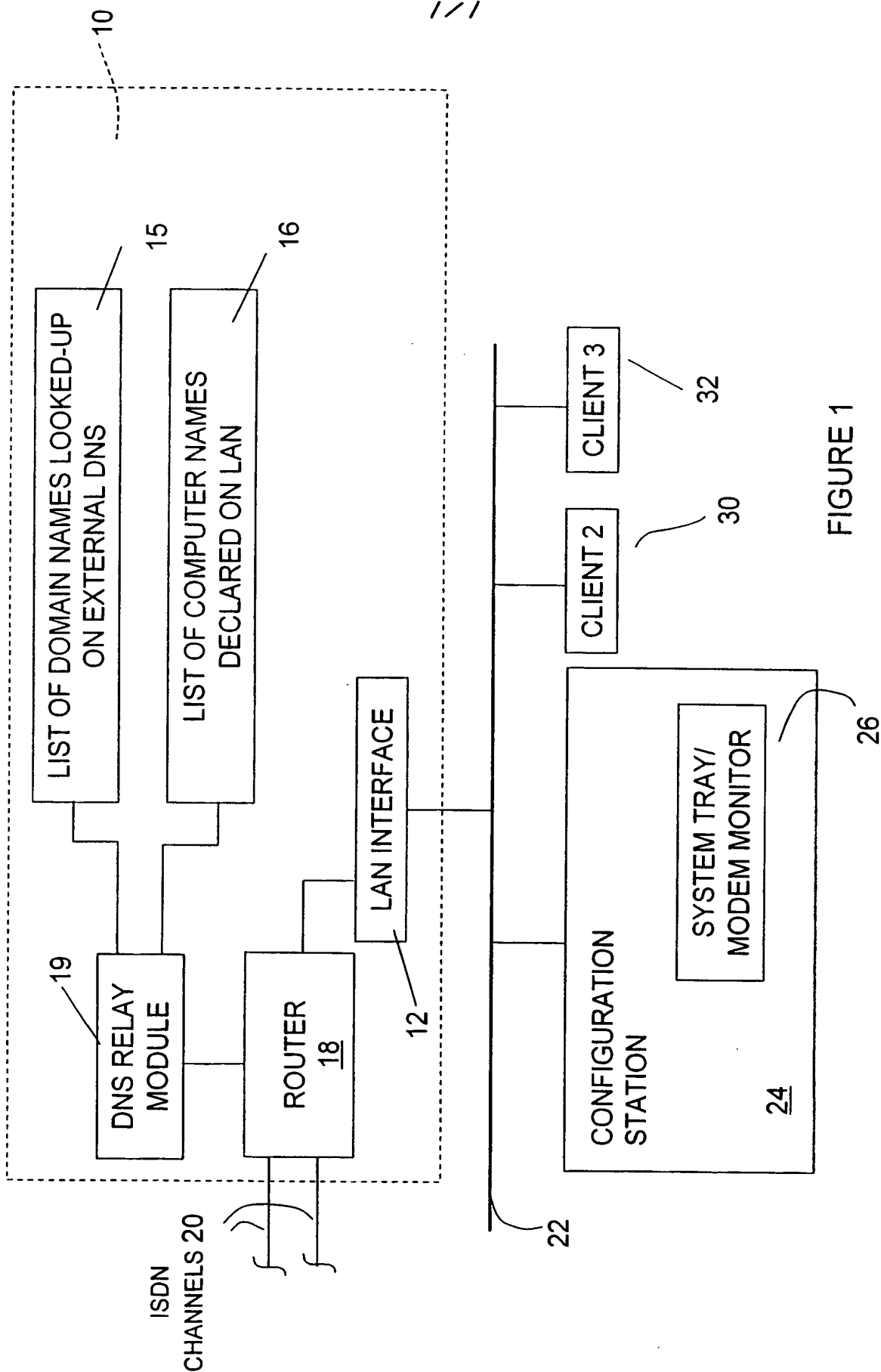


FIGURE 1

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/CA 99/01012

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/12 H04L12/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>ROWE K E ET AL: "Reliability of WWW name servers"</p> <p>COMPUTER NETWORKS AND ISDN SYSTEMS, NL, NORTH HOLLAND PUBLISHING. AMSTERDAM, vol. 27, no. 6, 1 April 1995 (1995-04-01), pages 773-780, XP004013179</p> <p>ISSN: 0169-7552</p>	13-16, 19, 21
Y	abstract	1, 2, 4, 7-9, 11
A	<p>page 773, left-hand column, line 1</p> <p>-right-hand column, line 11</p> <p>page 775, right-hand column, line 11 -page 776, left-hand column, line 28</p> <p>figure 1</p> <p style="text-align: center;">— — — — — -/-</p>	3, 5, 10, 12, 17, 20, 22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA

European Patent Office, P.B. 5618 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lievens, K

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 99/01012

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 26548 A (WHISTLE COMMUNICATIONS CORP ; COBBS ARCHIE L (US); LI JIM Y (US); 0) 18 June 1998 (1998-06-18)	1, 2, 4, 7-9, 11
A	abstract	3, 5, 10, 12, 17, 20, 22
	page 1, line 27 -page 4, line 32 page 6, line 12-15 page 7, line 17 -page 10, line 30 page 11, line 32 -page 12, line 11 page 15, line 17-23 page 17, line 18 -page 20, line 32 figure 6	
A	"NETBIOS ADD.NAME IN SWITCHED NETWORKS" IBM TECHNICAL DISCLOSURE BULLETIN, US, IBM CORP. NEW YORK, vol. 35, no. 2, 1 July 1992 (1992-07-01), pages 404-407, XP000313337 ISSN: 0018-8689 page 404, line 1-41	6, 17, 18, 20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 99/01012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9826548 A	18-06-1998	US 6012088 A	04-01-2000
		AU 3572697 A	03-07-1998
		EP 0953248 A	03-11-1999